A retrospective, cohort study of the prevalence and risk factors of oral burning in patients with dry mouth

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Objectives. The aims of this study were to evaluate the prevalence of oral burning in a dry mouth cohort of patients and to determine associated factors.

Study design. A retrospective cohort study was conducted by reviewing the charts of 170 patients who presented to Carolinas Medical Center’s Department of Oral Medicine from January 2004 to June 2009. Information collected from their charts was extensive.

Results. Forty percent (68 of 170) of dry mouth patients had a concomitant complaint of oral burning. Sixty-four were female and 4 were male. The mean age was 61.1 years (range 25-89). Cofactors associated with oral burning included age (OR 1.03, CI 1.00-1.05, \(P = .028\)) and use of herbal medications (OR .26, CI .10-.67, \(P = .005\)).


Xerostomia is the subjective complaint of oral dryness. Hyposalivation, on the other hand, is an objective measure of reduced salivary flow. In up to one-third of cases, the subjective complaint does not reflect an objective state of dry mouth. Xerostomia may occur with altered oral sensory function, changes in salivary composition and viscosity, and/or reductions in stimulated or unstimulated salivary flow rates. The reported causes of xerostomia are numerous, including systemic diseases (such as Sjögren’s syndrome), dehydrations, medications, head and neck radiotherapy, and psychological factors. Lack of agreement persists on the issue of xerostomie changes as a result of aging, with the possibility more likely related to systemic disease and/or drug side effects. Bergdahl reported that subjective oral dryness was often associated with complaints of burning mouth, muscle pain, taste disturbances, and dry eyes. Additionally, individuals with a subjective complaint of dry mouth also had less measurable unstimulated and stimulated salivary flow.

Saliva has multiple physiological functions and plays a crucial role in preserving and maintaining oral health. Saliva maintains the oral antimicrobial activity of enzymes, histatins, and immunoglobulin A (IgA) as well as the ongoing remineralization of the teeth by calcium and phosphate ions. It functions to form a mucin layer on the oral mucosa and pellicle formation of the teeth to facilitate movements during speech, eating, and swallowing, and to reduce tissue trauma. Patients with reduced salivary flow may have difficulty with communication (speech) and nutrition (chewing, swallowing, and digestion), be more susceptible to opportunistic infections, and have increased levels of dental decay. Salivary hypofunction has been reported to be one of the precipitating factors for burning mouth syndrome.

A subjective complaint of oral burning occurs less frequently than a complaint of oral dryness. Postmenopausal women make up most patients presenting with an intraoral burning complaint (ratio 5.6:1), with the tongue as the primary site (91%). The possible etiologies of burning mouth are many and complex. Potential etiologies include local factors, such as para-functional oral habits (unconscious activities, such as tongue thrusting and teeth grinding), allergic contact stomatitis, decreased salivary flow, and infections (bac-
terial, fungal, or viral). Systemic factors, such as hematocrit deficiencies, hormonal deficiencies, and connective tissue diseases have been implicated in association with a burning mouth sensation. Angiotensin-converting enzyme (ACE) inhibitors have been implicated as a potential cause of oral burning.

The International Association for the Study of Pain defines burning tongue or oral dysesthesia as “burning pain in the tongue or other oral mucous membranes” and Maltzman-Tseikhin et al. reported that the diagnosis of burning mouth syndrome (BMS) can be given, “only after all other possible causes have been ruled out.” One group found that analgesic medication protected their elderly patient population against burning mouth. In addition to analgesics, psychotropics and medications for the cardiac and digestive system were identified as protective factors from BMS by a different group.

In the current literature, no consistent relationship exists between the symptoms of oral burning and dry mouth. Table I summarizes previous studies and the relationships between xerostomia, salivary flow, and burning mouth complaints. The primary aim of the present study was to evaluate the prevalence of oral burning in patients presenting with dry mouth. The secondary aim was to determine factors associated with the presence of oral burning. We hypothesized that a high percentage of dry mouth patients would have a concomitant complaint of oral burning.

**MATERIAL AND METHODS**

A retrospective cohort study was conducted involving patients who presented to our department with a complaint of dry mouth. We evaluated the dictation notes and charts of patients meeting these criteria from January 2004 to June 2009. Nine hundred fifty-two new patient encounters were examined and 170 met the inclusion criteria. Nine hundred fifty-two new patient encounters were examined and 170 met the inclusion criteria. Inclusion criteria included answering yes to at least one of the following questions: “Have you had a daily feeling of dry mouth for more than 3 months?” or “Do you frequently drink liquids to aid in swallowing dry foods?” Both questions are from the Revised International Classification Criteria for Sjögren’s syndrome oral symptoms section and were previously identified by Fox et al. as an objective measure of salivary gland performance. Patients may not have had a chief complaint relating to a dry or burning mouth; however, dry mouth complaints were often discovered through questioning in the review of systems. Further questioning often elicited a complaint of burning symptoms. The patient also had to have unstimulated and stimulated salivary flow measurements completed. Salivary flow collection was performed in a quiet room without distractions. Patients were instructed to come to the appointment without having had anything to eat or drink, or placed anything in their mouth 1 hour before their visit. Unstimulated collection was performed by having the patient swallow once, before collection, and timing began thereafter with the patient expectorating into a collection tube over the next 5 minutes. Stimulated collection was performed by having the patient swallow once, before collection, and timing began thereafter with the patient chewing on paraffin and expectorating into a collection tube over the next 5 minutes. Collection tubes (with paraffin) were weighed before and after testing to attain the salivary flow measurement. We excluded patients without dry mouth complaints, with acute odontogenic or periodontal infections, who had received head and neck surgery and/or radiation therapy, and those with a history of radioactive iodine therapy for thyroid disease. The hospital’s institutional review board approved the study protocol.

The associations and the magnitude of associations between risk factors and the presence of oral burning were determined. The dichotomous response variable for the present study was oral burning versus no oral burning. Univariate analyses were performed using the $\chi^2$ or t test, or appropriate nonparametric tests. A P value less than .05 was considered significant. Variables thought likely to have prognostic value from former studies and cofactors potentially associated with burning identified with univariate analysis were entered into a multivariable logistic regression analysis. Odds ratios were calculated to represent the relative risk of the potential cofactors. Analyses were performed with the SAS statistical program (SAS Institute, Inc., Cary, NC).

**RESULTS**

A total of 170 patients met the inclusion criteria for the study. Of the 170 subjects, 17 (10%) were male and the remaining 153 (90%) were female (Table II). The mean age for all patients was 58 years with a range of 25 to 89 years. Sixty-eight (40%) of the 170 patients reported a complaint of oral burning; 64 were female and 4 were male. The mean age was 61.1 years (range 25-89) for patients reporting oral burning. The mean unstimulated salivary flow was 2.51 mL/15 min (range 0-15) and the mean stimulated salivary flow was 10.43 mL/15 min (range 0-50.7). The mean unstimulated salivary flow was 61.1 years (range 25-89) for patients reporting oral burning. The mean unstimulated salivary flow was 2.51 mL/15 min (range 0-15) and the mean stimulated salivary flow was 10.43 mL/15 min (range 0-50.7). The mean unstimulated salivary flow was 2.7 mL/15 min for patients with a burning complaint and 2.4 mL/15 min for those without a burning complaint. The mean stimulated salivary flow rate was 9.3 mL/15 min for patients with a burning complaint and 11.2 mL/15 min for those without a burning complaint. Table II shows the univariate analysis
of selected factors for dry mouth patients with and without a complaint of oral burning. Age, herbal medication, and removable prostheses were significant cofactors for oral burning in the univariate analysis. Nonsteroidal anti-inflammatory drug (NSAID) use approached statistical significance.

Potential cofactors in the logistic regression model included age, gender, current smoking, removable prostheses, Sjögren’s syndrome, stimulated saliva, taste disturbance, and herbal medication. Using a backward elimination analysis, age (odds ratio [OR] 1.03, confidence interval [CI] 1.00-1.05, \( P = .028 \)) and use of
herbal medications (OR 0.26, CI 0.10-0.67, \( P < 0.005 \)) were found to be significant.

Fifty-one (30%) patients met the American–European criteria for Sjögren’s syndrome (SS): 39 primary SS and 12 secondary SS. Oral burning was identified in 23 (45%) of all patients with SS, with no difference between SS and non-SS patients, and no differences between primary and secondary SS.

**DISCUSSION**

We hypothesized that a high percentage of patients with dry mouth would have a concomitant complaint of oral burning, and found a prevalence of 40% (68 of the 170 patients) in this dry mouth cohort. Potential cofactors found to be associated with oral burning included taking herbal medications (OR 0.26) and age (OR 1.03), respectively.

Several authors have found certain medications to be an important risk factor for burning mouth. Pajukoski et al.\(^5\) found a statistical trend of psychiatric drugs increasing the risk of burning mouth in hospitalized elderly patients (OR 4.2, CI 0.9-20.0, \( P = .07 \)), whereas analgesic medications were found to protect against burning mouth in elderly hospitalized patients and elderly outpatients (OR 0.5, CI 0.3-0.9, \( P < .05 \)). Soares et al.\(^22\) identified analgesics (OR 0.900, CI 0.366-2.214), psychotropics, medications for the digestive system, and medications for the cardiac system to be protective against BMS in their study. Similarly, our univariate analysis suggests that NSAIDs may be protective against burning. Our data reveals that herbal medications may be potential cofactors associated with reducing the likelihood of oral burning in patients with dry mouth. Some of these herbal medications may be substituted for prescription drugs that have been shown to be protective against burning (for example, analgescics, psychotropics, and medications for the digestive and cardiac systems), and therefore by the same mechanism, the herbal medications may be protective against oral burning. It is also possible that herbal medications are not protective, but rather their use may be an alternative for xerostomic prescription medications that can precipitate a feeling of burning mouth.

We also identified age as a predictor of oral burning. For each successive year, a patient with a dry mouth complaint was 3% more likely to have a complaint of oral burning. This seems plausible because it is well known that older adults take more medications (because of more medical problems) than their younger counterparts. These multiple medications may cause xerostomia that can lead to fungal infections and a sensation of burning. This contrasts with a study done by Pajukoski et al.\(^5\) where they found that age did not emerge as an explanatory factor for the symptoms in any of the statistical analyses made. Prevalence reports generally paint a picture of the patient with oral burning as being a perimenopausal female with a complaint of tongue burning, stinging, itching, or pain.

Numerous studies have investigated the relationships between xerostomia, salivary flow, and burning mouth complaints. The current study was unique, with a younger population than some studies and with a very thorough collection of data from patients’ charts. For example, our patient population (ranging from age 25-89 years) was younger than the Pajukoski et al. study\(^5\) (elderly hospitalized patient and outpatients). Also, our study had a cohort of patients with dry mouth, rather than a randomly selected sample (such as Berghdahl\(^7\)), or a cohort of patients with oral burning (such as Nasri et al.\(^17\)). We conducted this study to investigate the prevalence of burning in patients with dry mouth and to study potential cofactors. Extensive information was collected (see Material and Methods section), which allowed for numerous potential cofactors to be analyzed.
Suh et al. studied a cohort of patients with dry mouth (n = 78) and found that a sensation of burning mouth was the most common dry mouth–associated complaint (78.2% of subjects). Our population was more than double in size, but had a prevalence of only 40% of patients with dry mouth having concomitant oral burning. The age of patients in both studies was similar.

Studies have varied with regard to correlations between a burning sensation and unstimulated and stimulated salivary flow rates. We discovered that patients with an oral burning complaint had a slightly increased unstimulated salivary flow rate and a decreased stimulated salivary flow rate compared with patients without an oral-burning complaint (nonsignificant). Pajukoski et al. reported that the mean saliva flow was higher among hospitalized men with complaints of oral burning compared with those without the symptom (significant), whereas Bergdahl reported significance in finding that women with burning mouth had a lower stimulated salivary flow. Tammiala-Salonen et al. found that BMS patients had higher flow rates than controls, but the difference was not significant. Explanations could support causation of burning for both increased and decreased salivary flow rates. Patients with burning may have higher flow rates because the burning sensation could be irritating and thus cause an increased flow. A decreased flow could lead patients to be at higher risk of having a fungal infection, which could manifest as a burning sensation.

There are several limitations to our study. The study was limited by its retrospective nature and data collection. All data collected were confirmed by the 2 same researchers; however, limitations could result from the initial data collected during the patient interaction and the recording of such data. A second limitation is that some patients studied did not present with a chief complaint of dry mouth or burning mouth. These complaints were elicited during the patient interview. This may affect the generalizability of conclusions because both patients with a chief complaint of dry and/or burning mouth were studied with patients without that as their chief complaint. In addition, patients may have answered, “yes” to having a daily feeling of a dry mouth, but the feeling may have been transient and occurred only at awakening. Xerostomia is difficult to study because it is a symptom. Lastly, a limitation exists in the grouping of herbal products. Because a single herbal product or products did not occur with a frequency allowing the herbal product to be statistically analyzed on its own, all herbal products were included in this category. Therefore, it is difficult to know if herbal products as a whole or only particular ones influence complaints of oral burning.

Danhauer et al. proposed criteria for distinguishing between patients with BMS and patients with oral burning. They found improved treatment outcomes with this differentiation. It was reported that when treatment was provided that corrected an identifiable abnormality, significantly (P < .05) more oral burning than BMS patients reported a greater than 50% relief from symptoms (72.5% versus 41.2%, respectively). The goal of treatment of xerostomia and oral burning is to reduce symptoms by identifying and eliminating the cause(s) of the problems. Contributing factors to either or both of these problems include candidiasis, drugs, hyposalivation, mucosal disturbance, diabetes mellitus, nutritional deficiency, gastroesophageal reflux disorder, hypersensitivity reaction, oral prosthesis, parafunctional habit, and psychologic. BMS, in which burning is present without an identifiable underlying cause, can be treated beneficially with low-dose neuroleptic agents.

Xerostomia and hyposalivation can be treated with moisture and lubrication enhancement by providing the patient with salivary substitutes orialogues. Few effective strategies exist to address oral burning; strategies that target oral dryness and the use of specific pharmacologic agents for oral burning identified in these retrospective studies could prove valuable.

REFERENCES

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